Tracing the Visibility of Swedish LIS Research Articles by Using Altmetrics

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Abstract: Scholarly impact and visibility have traditionally been assessed by estimating the number and quality of publications and citations in the scholarly literature. But now scholars are increasingly visible on the Web. Twitter, Mendeley and other social media platforms are quite well-known and interesting tools for sharing research articles among scholars. Based on the capabilities of altmetrics, this thesis analyses the altmetric coverage and impact of LIS articles published by Swedish universities during 2013 to 2017. It also tries to paint a picture of demographic of people engaged with these articles. The most common altmetric sources are considered using a sample of 170 LIS journal articles. The findings were interpreted using two different sociological theories: the normative theory of Merton’s norms and the theory of social constructivism. The result of the study showed that Mendeley has the highest coverage of journal articles (65 percent) followed by Twitter (33 percent) while very few of the publications are mentioned in blogs or on Facebook. Researchers were the main Mendeley readers of articles with 53 percent, followed by the general public at 26 percent. This study, on the other hand, found out that public users were the main group that shared articles on Twitter. The list of articles with a high number of tweets showed that most topics in the field of LIS are associated with bibliometrics and citation impacts. The results demonstrate that the adoption of altmetric methods within the LIS fields is inevitable, but several issues must be considered to identify their potential.

Keywords: Altmetrics, LIS, Research Articles, Social media, Twitter, Mendeley
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1 Introduction

It is customary to use the number of citations of an academic paper as a basis for measuring its impact and visibility in the scientific sphere. Such information can be found on a number of databases such as Scopus and Web of Science (WoS), which show the level of acceptance of the work in scientific society (Bar-Ilan et al., 2012, p. 1). This is not the full story though, as citations only reflect the impact of an academic work within the academic world but do not measure the impact on the non-academic, e.g. general public. (Haustein, 2012). Another aspect that the traditional citation-counting method misses is the footprint of an author left behind by the activities of the author on the web – now footprint left mainly on social media platforms. These platforms open up new possibilities to acquire better understanding of the impact and visibility of scientific research, and this is the realm of altmetrics (Bar-Ilan et al., 2012, p. 2).

Since altmetrics were developed, library and information science (LIS) have played a key role in growing and supporting altmetrics, metrics, and impact. As Roemer and Borchardt (2015) mentioned, libraries still continue to take primary responsibility for the acquisition of bibliometric tools, especially Web of Science, Journal Citation Reports, and Scopus, as well as educating people about them. Because librarians have experience with providing support for these tools, it seems only reasonable that they have also assumed a support role for a wide range of altmetrics sources and tools. In addition, librarians’ important role stems from that fact that not only they are familiar with altmetrics resources, but also have a role as communicators and educators of the public. This role will give them the possibility to become the neutral voice of and advocate for the needs of the community, as they provide insights and feedback about the tools and metrics they use and support because of their knowledge, experience, and expertise. (Roemer & Borchardt, 2015).

Researchers utilise web in different way, either as means of communication (Shingareva & Lizárraga-Celaya, 2012), or as vessel for data collection and spreading scientific information (Chen et al., 2009; Polydoratou & Moyle, 2009). A scientific publication has wide range of options to get to realm of internet, Author’s personal website, Research group online communities, established publications websites, weblogs, disciplinary repositories such as ArXiv and RePEc, as well as online social platforms like Mendeley, academia.edu and ResearchGate. Social web by definition is a series of links that connect people with one and other (Appelquist et al., 2010). These new platforms give researchers the possibilities to engage, promote and interact with each other via set of tools such as tags and comments and online publication (Neylon & Wu, 2009). Thus, as a promising method for measuring research impact in social science, altmetrics which usually rely on data from the social web, can be considered as reliable measures (Tang et al., 2012). This measure helped to provide a better understanding of cultural factors in adopting social media. Data sources are at the core of these studies and the penetration rate of altmetrics services for various fields is not a primary issue. The reason behind the focus on the data sources and possibilities they provide is the novelty of altmetrics methods. But if altmetrics can be seen as a substitute for more conventional methods of measurement, then it should be investigated from the overall perspective of various publications (Hammarfelt, 2014).
Furthermore, it is required to study particular areas of research as ‘‘an important aspect of the evaluation of altmetrics is to identify contexts in which it is reasonable to use them.’’ (Sud & Thelwall 2014, p. 7). Therefore, this study will try to utilize altmetric scores as means of measuring the impact of LIS research articles in Sweden from 2013 to 2017 and will also address the demographic makeup of the people who used and shared these articles. The following chapter will give an overview of altmetrics. Furthermore, the section explains the thesis’ research questions and outlines its limitations.

1.1 What are altmetrics?

In the altmetrics Manifesto published on the web in October 2010, the concept of “altmetrics” is introduced as follows:

“No one can read everything. We rely on filters to make sense of the scholarly literature, but the narrow, traditional filters are being swamped. However, the growth of new, online scholarly tools allows us to make new filters; these altmetrics reflect the broad, rapid impact of scholarship in this burgeoning ecosystem. We call for more tools and research based on altmetrics (Priem et al., 2010).”

The above manifesto is the birth of altmetrics. It emerged from the observation that the social web provided opportunities to create new metrics for measuring the impact and use of scholarly publications (Thelwall, 2014). These metrics provide researchers and other interested groups with data, such as discussions surrounding articles and the level of academic engagement with a text, as well as providing a means to measure such activities.

This new approach and its promoters have the strong desire of providing an alternative to or a development of traditional citation metrics by measuring scholarly interactions performed primarily on the social media platforms (Piwowar & Priem, 2013). These interactions may take the form of article views, downloads, or tweets. They could also be collaborative annotations using such tools like social bookmarking, reference managers, and comments on blog posts (Baykoucheva, 2015). As Kurtz and Bollen point out, “Today, for every single use of an electronic resource, the system can record which resource was used, who used it, where that person was, when it was used, what type of request was issued, what type of record it was, and from where the article was used” (Kurtz & Bollen, 2010, p. 4). The more or less common “use” of research output can not only be seen as the direct impact of research, but also as evidence of “real” impact (Neylon, Willmers, & King, 2014). Altmetrics is getting so much attention that one of the most important database providers, Elsevier, recently acquired a start-up that provided a service for tracking and analysing the online engagement of people with a research article. Back in late 19th century, Elsevier began as a publisher of scientific and medical information in print journal and books. Currently it is the world’s leading publisher of Scientific and technical journals with worldwide audiences with different rank in academic societies (History, n.d) and right now this company did not stop there; the company also acquired Mendeley, a famous citation manager service with its own social network (Roemer & Borchardt, 2013).
Additionally, as Chamberlain (2013) and Piwowar and Priem (2013) point out, not only are scholars already putting altmetrics in publication lists in their CVs, but conferences on the subject are being scheduled (like altmetrics.org/altmetrics14), and companies (including ImpactStory and Altmetric) have been created to collect and provide altmetrics. According to Galloway, Pease, and Rauh (2013, p. 336) “altmetrics is a fast-moving and dynamic area.”

Given this rapid growth, there is a need for a taxonomy of these metrics to better understand them. The following categorization/classification system is used by the PLoS database (Lin and Fenner, 2013, p. 23):

1. Viewed: online actions regarding the access of an article;
2. Saved: online actions regarding the storage of article on online reference managers, providing sharing among researchers and better organizing;
3. Discussed: online discussions of article content (tweets, forum discussions or comments regarding an article);
4. Recommended: online actions that formally endorse article; and
5. Cited: citations of article on scientific journals.

Based on the above-mentioned capabilities, this thesis focuses on research articles in the field of LIS, using altmetrics to measure the engagement level of academic and scientific communities on social media sites such as Twitter and Mendeley, as well as on scientific blogs. This work will also try to paint a better picture than currently exists of the demographics of people engaged with these articles.

1.2 Research questions and Limitations

Researchers have always exchanged their ideas and criticized one another’s work. These discussions occurred offline before the invention of the internet, but now, with the advent of current technologies such as Twitter and Mendeley, a kind of reference manager software, these conversations have moved online. By capturing what is happening on social media platforms, it would be possible to find what researchers are discussing right now, in real time.

Customarily, counting publications and the number of citations in scientific literature was the only way to investigate visibility and scholarly impact. But the visibility of scholars and scholarship on the web has risen, leading to increasing presence in different social media ecosystems. (Bar.Ilan et al., 2012). Different acts on Web 2.0 Platforms, such as a tweet, a Facebook post, or a save in Mendeley became a more interesting way for scholars to share research and academic journals among themselves. Even the reputation of social media platforms as untrustworthy – they are easily manipulated – could not stop the growing interest in using altmetrics as a means of identifying the impact of these interactive tools in research evaluation (Eysenbach 2011; Thelwall et al., 2013). The broader impact of research is, after all, easily captured through altmetric tools immediately after its publication (Tenopir & King, 2000). Therefore, the primary aim of altmetrics is to measure the interaction between scholars as they share research publications on the web, using social media tools (Howard,
2012). But how broad and established is this interaction, and how do measures of social web impact compare to their more traditional counterparts?

1.2.1 Research questions

In recent decades, attention to the changing LIS research environment has increased. Internationally, there is an interest in not only how scholars use social media as part of their research lifecycle (Bonnand & Hansen, 2012; Tenopir et al., 2013), but also in the type of altmetrics generated by social media behavior. This is an area that, although relatively unexplored in relation to Swedish LIS publications, offers useful insights into their audiences. To this end, this study is conducted with these goals in mind. First, the thesis will trace the visibility of LIS academic papers with the larger goal of analysing the research impact of academic practices on social media platforms; and second, the thesis will investigate to what extent these papers are visible for different target groups and, specifically, for the librarian community.

Because assessments of the research impact of LIS have traditionally used bibliometric analysis, how is this impact on the term of altmetrics? Who shares articles? Are online interactions dominated by librarians? Which social media platforms are most popular among LIS scholars? Whether the use of social media to increase the effects of an academic article or argument is increasing? Which university in Sweden has the highest altmetrics score? What is the current trend in LIS research articles? Is there a visible trend? These are some of the fundamental sub-questions that will help to answer the main research questions of this study:

➢ What is the altmetric coverage and “impact” of academic articles published by researchers associated with Swedish universities within the field of LIS between 2013 and 2017?

➢ What is the demographic makeup of the people who used and shared these articles?

➢ Which research topics in LIS received most altmetric attention between 2013 and 2017?

This study will try to answer these questions by utilizing alternative indicators based on web patterns and social media use (Mendeley reader counts, Twitter mentions, Facebook).

1.2.2 Limitations

The data used in this study was collected from altmetric.com, which assigns a score to each article by calculating how often the work has been mentioned on different social media platforms. To track and collect a numerical measure of the amount of attention a scholarly output receives, altmetric.com examines three essential components:

1. An output (journal article, dataset, etc.);
2. An identifier attached to the output like Digital Object Identifier (DOI) and Research Papers in Economics (RePEc). DOI is a unique and permanent identifying number for a piece of content, registered with an online directory system (Digitla Object Identifiers, 1998). RePEc is another known bibliographic service designed for field of economics and its related fields. It consists of information such as Author of the paper, place it was published, readership and where it surface again in academic journals. This information later will be used to generated a computer ranking of these contributing factors, individuals, organization and even country of origin to name a few. It should be mentioned that despite being experimental these rankings are well accepted in scientific communities (Zimmermann, 2013).

3. mentions in a source (Williams, 2017).

Although altmetrics enables users to have a quick view of the impact of research output, like any other metric, altmetrics has limitations that affect this study.

Due to the fact that Altmetric.com does not currently contain all possible sources in its database, scholarly works which are mentioned on other social media and web platforms may be excluded or incorrectly identified. Most of the data gathered in this study is derived from only five sources: Mendeley, CiteULike, Facebook, Twitter, and blogs. It is possible that some articles were mentioned on other social media sites, and some researchers might not have an account for the five source platforms, which affects the score of some articles.

Another limiting factor is that altmetric.com’s circulation data only includes impact scores for articles published in English. For this reason, this study only focuses on articles written in English and ignores articles in Swedish or other languages.

Moreover, this database only indexes the articles with DOI. Therefore this study could not consider all articles extracted from SwedPub — a database containing publication data from 40 Swedish universities — during the selected period 2013-2017. Another limitation that may affect the result of this study was the data quality. Data in altmetric.com’s database is dynamic, which means that records can be deleted, altered, or added. This aspect of altmetrics will result in inconsistency in the quality of the data. More clarification about these limitations and their effects on validity and reliability have been provided in method section of this study.

### 1.2.3 Outline of the thesis

The present study is organized into eight chapters. The introduction of the thesis in chapter one aims to introduce the research topic. The chapter has explained the term altmetrics and provided the research questions and study limitations. Chapter two includes the background about different metrics and how these metrics led to the development of altmetrics. This chapter also discusses different altmetrics tools and altmetrics advantages, providing the basis for this study and the implications of altmetrics in the research field of LIS. The third chapter includes the literature review and tries to unravel both the ongoing debate about the field of library and information science and also describe empirical studies of altmetrics. Chapter four explains the
theoretical framework that will be used to interpret the results of this study. The two theories used to interpret opinions of altmetrics are normative theory of Merton’s norms and social constructivism. Chapter five presents the methodology used in this study, providing an overview of the methods applied in the collection and analysis of data. The chapter also presents ethical issues connected to this study. Chapter six revolves around results. The chapter comprises three main parts based on the research questions. First, it offers an overview of altmetrics coverage in LIS articles. The second part focuses on the demographic data of people who used and shared LIS articles. And the last section presents the main themes of LIS research in Sweden between 2013 and 2017. Chapter seven focuses on answering the research questions alongside a discussion of the findings. Chapter seven concludes the discussion and summarises the key findings. The last chapter, Chapter eight, is a summary of this study.
2 Background

This chapter will give an overview of altmetrics, providing context. This chapter will analyse the history of altmetrics and the technique’s relationship with bibliometrics. A discussion of the major tools currently used in the area follows. Finally, the chapter will focus on the advantages of altmetrics.

2.1 From Bibliometrics to Altmetrics

Bibliometrics is the statistical analysis of books, journals, scientific articles and, authors. The term encompasses word frequency analysis, citation analysis, and counting the number of the articles of authors, amongst other forms of statistical analysis (Karanatsiou, Misirlis, & Vlachopoulou, 2017, p. 16).

Scientometrics is the study of science and technology with a focus on the interaction between scientometric theories and scientific communication (Mingers & Leydesdorff, 2015; Hood and Wilson, 2001). It is also the study of the bibliographies, as well as the evaluation of the scientific research and information systems (Van Raan, 1997).

Additionally, Tague-Sutcliffe (1992) explains the concept of informetrics as the study of the quantitative aspects of information in any form, not just records or bibliographies, and in any social group, not specifically scientists. The term informetrics was first coined by Nacke in 1979, but it only became an accepted category within bibliometrics and scientometrics in 1984, covering the basic definition of both metrics and characteristics of retrieval performance measures (Hood & Wilson, 2001; Brookes, 1990).

In 1999, with the advent of Web 2.0 and its effects on scientific discussions, webometrics were introduced to analyse linking, web citation, and search engine evaluation (Bar-Ilan, 2008; Thelwall, 2008). Online data is dynamic and can be considered as a huge bibliographic database of sites that work like scientific journals and from which web citations can be extracted. Applying data mining techniques to user-generated content on the internet, researchers can extract information on the impact of such data on scientists and researchers (Thelwall, 2008). Studies show that web citations are closely related to the Web of Science (WOS) citation count. Web citation collection is built on online conferences and science blogs and platforms (Thelwall & Kousha, 2015).

The quick growth of Web 2.0 and the considerable use of social media, the rapidly increasing availability of online literature, and online scholarship tools, all contributed to increasing scholarly communication online (Liu & Adie, 2013). Therefore, alternative metrics and measurements developed as a supplement to scientometrics and webometrics, in order to evaluate the influence of online practices on science; this kind of study became known as altmetrics (Priem, Groth, & Taraborelli, 2012). They can use as filters, which “reflect the broad, rapid impact of scholarship in this burgeoning ecosystem” (Priem et al., 2010). These terms are similar and often combined together. As with “bibliometrics” or “scientometrics”, the term altmetrics has been used to refer both to field of study and to the metrics or collected statistics themselves. Since
altmetrics is concerned with measuring scholarly activity, it is also a subset of scientometrics. And because it has been used to measure activities on the Web, altmetrics can also be considered a subcategory of webometrics. Altmetrics focuses more narrowly on online tools and environments, rather than on the Web as a whole (Priem, 2015). The picture below illustrates how the terms are linked.

![Diagram illustrating the relationship between informetrics, bibliometrics, cybermetrics, scientometrics, webometrics, and altmetrics]

Fig 2.1: Haustein, 2015, Adopted from Björneborn & Ingwersen (2004, p. 1217).

### 2.2 Altmetrics tools

There are a variety of ways to access altmetrics data. The Scopus database has a web application from altmetric.com that displays the altmetric value of an article if available. And publishers like PLOS One and Elsevier have also integrated user statistics which include, for example, HTML views and PDF downloads. Aggregator collects metric data and information from multiple sources online. It varies how the altmetrics aggregators collect and present data. This section provides information about the main largest tools such as Altmetric.com, Impactstory, and Plum Analytics that currently use in this field.

**Altmetric.com** ([www.altmetric.com](http://www.altmetric.com))

Altmetric.com is a London-based company that traces and analyses the altmetrics activity of scientific articles. The company markets itself to institutions, publishers, and researchers. They have three different products including altmetric bookmarklet, altmetric bookmarklet integrations, and Altmetric Explorer for Institutions (Roemer & Borchardt, 2015).

The altmetrics bookmarklet is compatible with all major browsers other than Internet Explorer (IE) and Microsoft Edge and provides the user with altmetrics scores and
essential and detailed information in different platforms. Moreover, the information about people who tweeted or used these materials can be seen and used for further analysis.

In addition to Altmetric Bookmarklet functionalities Altmetric Bookmarklet Integration can be combined with individual journal articles on Scopus, in institutional repositories such as DSpace, and on journal articles published by business like SAGE, HighWire, and Nature Publishing Group (Ibid).

Altmetric Explorer for Institutions provides summaries of data at higher levels of evaluation. The service allows an individual to view altmetrics data for many journal articles, grouped by author or by source (journal). Considering a small variation on the interface which aims to address different target groups, both offer valuable analysis of wide range of comparison on altmetrics (Ibid, p. 15).

Altmetric.com uses rankings for their data analysis. For example, news items are weighted more heavily than blogs, and blogs are more highly regarded than tweets. The algorithm also takes into account how authoritative the authors are. Results are presented visually with a donut that shows the proportional distribution of mentions by source type, with each source type displaying a different color—blue (for Twitter), yellow (for blogs), and red (for mainstream media sources) (Baykoucheva, 2015).

However, a DOI digital object identifier is required to retrieve data from Altmetric.com. The lack of DOI is a problem for older articles, even for articles that were written after the invention of the internet. To view an individual researcher's metric data, it is necessary for the institution to subscribe. Illustration two on the next page shows an example of how an article's metric score may look like.

ImpactStory (www.impactstory.org)

ImpactStory was founded by Heather Piwowar and Jason Priem as a Non Governmental Organization (NGO) with the goal of helping researchers examine the impact of their research. Their research profiles are based on altmetric sources such as Altmetric.com, Arxiv, Scopus, and Wikipedia. ImpactStory collects a variety of metrics with the goal of collecting and sharing impact data from all research projects by all researchers through open data. Even though it is a non-profit organization with entirely open data, there is a fee for creating a profile on ImpactStory (Roemer & Borchardt, 2015). The company offers a free one-month trial. The online service tracks journal articles, preprints, datasets, presentation slides, research codes, and other research outputs. It is known that ImpactStory aggregates data from Mendeley, GitHub, and Twitter, but the company does not disclose all its sources (Baykoucheva, 2015).

ImpactStory’s uniqueness lies in its analysis and ability to display the impact of one’s research in an easily understandable format, called an “impact story”. Users may need to import their items into ImpactStory, which in turn automatically gathers impact statistics from Scopus, Mendeley, Google Scholar, Slideshare, ORCID, and Pubmed Central. However, ImpactStory is not synchronized with the systems mentioned above and cannot automatically update its content. This application is an excellent tool for scholars who want to trace the impact of their web-native scholarship (Yang & Li, 2015, p. 233).

PlumX (www.plu.mx)

EBSCO owns Plum Analytics and, like ImpactStory, collects metric data and analyses it. Their product aimed at researchers is subscription system called PlumX. Researchers create a profile where you can categorize, visualize and analyse research results and impact. Plum Analytics collects data from an ever-expanding list of vendors such as EBSCO, PLOS One, Facebook, Twitter, WorldCat, Youtube, Scopus, PubMed, Wikipedia, Mendeley, and Amazon, to name a few. The company divides metric data into five different categories; usage (clicks, downloads, library loans), captures (bookmarks, saved favourites), mentions (blog posts, comments, Wikipedia links), social media (likes, divisions, tweets) and citations (Scopus, PubMed). Plum Analytics labels all of these downloads, blog posts, library loans, and so on as "artifacts"; an artifact is any research product available online (Roemer & Borchardt, 2015).

2.3 What are the advantages of altmetrics?

Supporters of the new approach to measuring the impact of research believe that altmetrics has many advantages compared to conventional bibliometric methods (Hammarfelt, 2014). The following list of the benefits of altmetrics is based on a categorization of the benefits mentioned in the literature by (Wouters & Costas, 2012). These authors recognized four benefits of altmetrics as compared to traditional metrics: 1. Broadness: the measurement encompass impact beyond the academic scientific community; 2. Speed: altmetrics measure impact soon after publication of the paper; 3. Diversity: altmetrics cover non-paper material; 4. Openness: altmetrics data is more accessible than traditional bibliometric data (Bornmann, 2014a, p. 898).
Broadness

Most summaries of the benefits of altmetrics emphasize their potential for measuring the broader impact of research (Priem, Parra, Piwowar, & Waagmeester, 2012; Weller, Dröge, & Puschmann, 2011) with the hope that this more encompassing approach will result in a greater understanding of outside interest in and use of academic materials (Fausto et al., 2012). In contrast to a reliance on citations, altmetrics offers an opportunity to measure the engagement of a larger group outside the academic world (Adie, 2014; Hammarfelt, 2014). Furthermore, the breadth of altmetrics could support more holistic evaluation efforts; a range of altmetrics may help to solve the reliability problems of individual measures by triangulating scores from easily-accessible “converging partial indicators” (Priem, 2015, p. 274).

Speed

Citation counts do provide a reliable and valid measurement, but can only be provided several years after an article’s publication (Wang, 2013). In comparison, altmetrics provides the data impact within very short length of time after the publication (Haustein et al., 2014). Many social web tools offer real-time access to structured altmetric data via application programming interfaces (APIs) (Priem & Hemminger, 2010), with which the impact of a paper can be tracked at any time after publication. Consequently, the use of altmetric methods could be a practical solution in fields where publication and thus citation processes are slow (Hammarfelt, 2014).

Diversity

Altmetrics are not simply another set of data but rather have the ability to provide a basis for the evaluation of the importance of scientific artifacts beyond text publications i.e. databases or statistical analyses (Bornmann, 2014a, p. 898).

This current demand for this broader approach is proof that other forms of scholarly products now play a crucial role in research evaluation (Piwowar, 2013; Rousseau & Ye, 2013). Therefore, altmetrics provides an opportunity to measure the impact of these research products both in science (Priem, 2015) and beyond science (Galloway, et al., 2013). As well as determining the impact of varying kinds of scientific material, altmetrics can also be used to trace a diversity of scholarly activities such as teaching and service activities (Rodgers & Barbrow, 2013). Accordingly, the diversity of fields with national and international scholars and, a large public audience should benefit from an approach that takes various publication channels into account (Hammarfelt, 2014).

Openness

Altmetrics provide a fascinating opportunity for measuring societal impact beyond the confines of a case study, given free access to data through Web APIs, which provide quick feedback about a large publication set (Galloway, et al., 2013). This context means that data collection is hardly troublesome (Thelwall, Haustein, Lariviere, &
Sugimoto, 2013). In addition, altmetrics data is currently based on platforms with distinctly determined boundaries and data types, as is the case with Twitter or Mendeley (Priem, 2015), which makes the analysis of data and the interpretation of results easier. Accessibility of information allows researchers to see their own impact statistics and the data for other publications. As Wouters and Costas (2012) observe, many altmetrics analysis services are not open to the public due to the secretive practices of large companies such as Twitter and Mendeley.

Regarding what above mentioned, it seems that recently altmetrics got more attention to be used in studies and to evaluate the impact of research publications. Promoters of this new method noted that altmetrics have many privileges (as explained above) in contrast to bibliometric methods for measuring the impact of research. Moreover, there are different ways to access the altmetric data and this study provided information about the three significant tools that currently being used in altmetric. Consequently, it could be concluded that altmetrics offer great potential to conduct a research which is the reason that current study also use it as a base. Additionally, among tools, altmetric.com is the most suitable tool for blogs, news outlets and tweets and Mendeley readers. Additionally it has been chosen because the information that is provided in this service not only can meet all the requirements for this study but also they are accessible.
3 Literature Review

The purpose of this chapter is to give the reader an overview of the debate about both Library and Information Science (LIS) and altmetrics. The first part focuses on a literature overview of the discussion about LIS. A literature summary of the development of LIS follows. The last section of the chapter summarizes several studies of different disciplines conducted using altmetrics.

This first part of the chapter does not discuss empirical studies in detail but rather focuses on highlighting the arguments put forward in literature based on different empirical studies. The reason that this part has been provided is to give a better understanding about the history of LIS, how this filed started to evolve and how it connects to other field in order to be consider as a multidisciplinary field. Since this study is trying to find the altmetric score of LIS research articles, the author provided some information about quantitative studies in this field to draw a better picture and make it more comprehensible for readers to know how LIS led to these different co-citation analyses and tools for visualization and who introduced these concepts as a first time.

Moreover, since this study focused on LIS Swedish research articles, it seemed necessary to give more information about the history of LIS in Nordic countries specifically Sweden and how this field developed and which universities in Sweden right now are the main schools offering LIS as a program. Unlike the first part, the last part of the chapter gives an overview over several empirical studies that have been conducted on altmetrics in different disciplines.

3.1 Library and Information Science: towards a definition of the field, a debate

For several decades, the identity of LIS has been discussed with a focus on topics like research objectives research practices, and interpretational frameworks. Lots of attempts have been made to define LIS with reasonable but flexible boundaries. Both general and specific definitions of LIS have been recommended, and all have been criticized for different reasons (Åström, 2006, p. 13). The ambiguity of LIS identity as a cohesive field stems from a wide range of definitions as well as various research directions and institutional structures; the result is a lack of clear understanding of the field itself (Ibid, p. 47).

There are around 700 definitions of information science, resulting in conceptual chaos identified by (Schrader, 1983). These definitions are followed by discussions of general attributes in LIS, including the historical and social background of the field, the structure of LIS and its relation to other fields, and the main conceptions and focus of the field (Ingwersen, 1992; Saracevic, 1999). (Hjørland, 2000) discusses LIS from a disciplinary and institutional point of view, identifying and investigating issues such as weak theoretical development in the field.

Additionally, studying the intellectual organization of LIS as well as quantitative studies of research literature has been a topic of discussion. By introducing different
co-citation analyses and tools for visualization, informetric studies began to replace cognitive maps of research fields. The author co-citation method was presented by White and Griffith (1981), mapping LIS and finding five main areas: bibliometrics, scientific communication and “precursors”, together with a “generalist” and an information retrieval area. This initial assessment was later revised when White and McCain (1998) applied author co-citation analysis in order to perform a domain analysis, finding two principal sub-disciplines and eleven research specialties.

Besides finding what LIS is, the main consideration on the analysis of the nature of LIS is to define what LIS should do. Given the need for a theoretical basis for LIS and the application of the term “information”, Brookes (1975) introduces the “fundamental equation”. Despite this attempt, the same lack of theoretical basis would be recognized almost 30 years later, by Hjørland (2000) and further discussed by Pettigrew and McKechnie (2001). This “fundamental equation” was applied by Brookes in order to introduce the “cognitive viewpoint” in LIS. However, the “cognitive viewpoint” has also been criticized for different reasons. To solve the issue of the “cognitive viewpoint”, an alternative point of view has been recommended by Hjørland and Albrechtsen (1995); “domain analysis” is proposed as a method of investigating information management and transfer. The current structure of LIS research has another application in domain analysis when it comes to wide range of research domains within LIS (Hjørland, 2002).

Lack of agreement on the name of field resulted in a shift more toward ‘information science’ or ‘information studies’ while on the non-Anglo-American academic communities LIS is the main name for the field. Different items such as methodological and epistemological stand point as examples not only influence the definition of a field but also how it’s been analyzed (Åström, 2006).

3.2 The development of LIS

The rise of LIS can be traced back to the 19th century, with the development of general rules for classification and cataloguing, as well as attempts at defining library procedure and routines (Åström, 2006).

It is clear that libraries have, for centuries, played a significant role in collecting, preserving and mediating access to the information in manuscripts and printed books (Reimo, 2008). To access and effectively navigate these massive storehouses of knowledge, users need supervision. Two or three centuries ago, the Bibliothecarius was an educated person with knowledge of different languages and the history of crucial contemporary political and academical figures as well as knowledge of the development of sciences; this was very admired position in society. (Ibid, p. 105).

LIS also developed in other fields such as Computer sciences, also during 40’s and 50’s LIS was playing the support role for science research (Åström, 2006, p. 42). Nowadays, LIS institutions can be found with affiliations ranging from the humanities to engineering, at universities and colleges as well as independent schools. Recently related disciplines like computer science and communication studies have been brought together by LIS institutions and create “Information schools” to deal with different aspects of information-related topics (Åström, 2008, p. 722). For instance, LIS at
Uppsala University and Lund University represent a merging of educational programs with archival studies and museology (Åström, 2006). Currently, there is a growing interest in managing and distribution of knowledge in other academic fields, which is traceable in the development of LIS in Nordic countries. An attempt started in the early 1970s to integrate LIS into the academic arena, and a goal achieved across major Nordic countries by the late 1990s. (Ibid).

Information school, as mentioned above, also known as iSchool, played an important role in the development of Information Science. Also known as “School of information” or “Department of Information Studies,” iSchool is a non-profit organization set up in 2005 that establishes university level organizations and professional association aiming at nurturing the field of information and technology (Chakrabarti & Mandal, 2017).

The iSchool movement started couple of years ago in United States as way for schools to expand their student base, considering their teaching capabilities, by offering various degrees in Library and Information Sciences. The goal was to train and educate professionals to work beyond libraries (”The iSchool Movement,” n.d)

The global network of iSchool has spread beyond the US and in Europe and Asia. In Scandinavia, a couple of universities and schools have joined the movement, starting with University of Borås, and expanding to the Royal School of Library and Information Science at Copenhagen University, the School of Information Sciences at the University of Tampere and the Department of Archivistics, Library and Information Science at Oslo and Akershus University of Applied Sciences are part of the iSchool movement. (“iSchools,” 2017).

In the terms of social development of LIS in the Nordic countries, plenty of analysis has been done. In the early 1990s, (Vakkari, 1996) and (Vakkari, 1993) studied Nordic LIS at a time when Finland was the only Nordic country with a fully developed academic research infrastructure. The analysis found a research environment with weaknesses to academia and a scattered institutional structure. Nordic LIS research has also been analyzed in a number of overviews and evaluations of Nordic LIS education, research and departments (Harbo, Pors, Enmark, & Seldén, 1998; Pors, 2000; Wille, 1999), explaining the development of Nordic LIS research and education during the last 15 years and how the field has proceeded through a procedure of formalization in terms of research organizations at universities, professorial chairs, and Ph.D. programs. In the Nordic and Baltic countries, there are seventeen universities and LIS schools offering Library and Information Sciences on at least a BA level — twelve in the Nordic (Auduson, 2005) and five in the Baltic countries (Reimo, 2008, p. 107). In an evaluation of the country’s LIS programming in 2004, six schools qualified as LIS educations. The Swedish LIS community consists of the older, more traditional universities of Lund and Uppsala, the newer universities of Umeå, Växjö, and Linköping, and finally the University of Borås, where the Swedish school of Library and Information Science (LIS) is located. Concerning LIS as a field, Borås offers a more encompassing approach, while other schools focus on different specialized areas of LIS. The University of Lund focuses its approach to more problem-based learning. Uppsala focuses on archives, libraries and museums. Umeå for many years was the leader for bibliometrics and scientometrics, garnering international recognition. LIS is placed within the department of sociology in the University of Umeå, and Växjö has positioned itself as a place with a focus on the pedagogical aspects of librarianship (Ibid).
3.3 Altmetrics in different disciplines

A number of studies explore altmetrics from different perspectives. An overview of these studies can be found, for instance, in Bar-Ilan et al. (2014), (Bornmann, 2014a), (Haustein, 2014), and Priem (2015). Many studies attempt to outline the meaning of altmetrics. According to Zahedi et al. (2014, p. 1510) altmetrics is still in its infancy and “at the moment, we don’t yet have a clear definition of the possible meanings of altmetric scores”. As Taylor and Plume (2014) mentioned, “altmetrics hold great promise as a source of data, indicators, and insights about online attention, usage and impact of published research outputs. What is currently less certain is the underlying nature of what is being measured by current indicators” (p. 19). Most of the studies have questioned the relationship between altmetrics and citation counts (Bornmann, 2014b). Moreover, Rousseau and Ye (2013, p. 3289) believe that although the idea behind altmetrics is valuable, the term is not appropriate. They suggest “influmetrics” instead. Similarly, Cronin (2013, p. 1523) recommend that “complementary” can be a better term rather than alternative in this context.

Altmetric data are usually provided from social media sites or social references managers. The application of these social media differs across research fields, and a study conducted by Rowlands et al. (2011) showed that natural scientists were often intended to use social media in their work. They also expect that the social sciences and humanities are likely to use more these websites in the future.

Some researchers have also used reference managers and social bookmarking websites to develop altmetrics. For instance, several bookmarking-based metrics and some traditional indicators have been compared in order to evaluate physics journals (Haustein & Siebenlist, 2011). Priem, Piwowar, and Hemminger (2012) investigated a large number of papers published by the Public Library of Science (PLoS). Mendeley covered around 80 percent of the PLoS articles while 31 percent and 10 percent of these papers were bookmarked on CiteULike and Delicious, though it is not completely fair to compare statistics between these sites because they use and record information in different ways. Around 10 to 12 percent of the sample were tweeted or mentioned on Facebook, and less than 10 percent of the papers were cited in blogs or reviewed by Faculty of 1000, a post-publication review site for biomedical papers. Similarly, previous studies have reported that Mendeley’s coverage is more extensive than CiteULike for a sample of articles published in Science and Nature (Li et al., 2012). The same results were found for publications in the bibliometrics area (Haustein et al., 2014). It has also been stated that Mendeley has the highest coverage among altmetrics resources for 20,000 random publications indexed in WoS (Zahedi, Costas, & Wouters, 2014). Furthermore, Mohammadi and Thelwall (2014) found that 44 percent of social science articles and 13 percent of the humanities papers from WoS in the year 2008 were covered by Mendeley. Similarly, a Hammarfelt (2014) investigation of 310 humanities scientific articles and 54 books written by scholars at Swedish universities in 2012 confirmed that Mendeley had the highest coverage of papers with 61 percent and followed by 21 percent from Twitter and negligible percentage for other tools such as Facebook.

Twitter is another common provider of altmetric data; Holmberg and Thelwall (2014) studied the acceptance of this service across disciplines, finding that only 2.2 percent of all tweets made by researchers in the selected fields link to academic articles.
Consequently, they reach the conclusion that although Twitter plays a crucial role for many researchers in scholarly communication, it is not frequently used to share information about scientific publications. A wide-ranging study of PubMed articles from 11 social media resources (except Mendeley) also reported that less than 20 percent of the papers were covered by most of the resources (Thelwall et al., 2013), with Twitter having the most extensive coverage at less than 10 percent for 2010 to 2012 PubMed articles and reviews (Haustein, Peters, Sugimoto, Thelwall, & Larivière, 2014). Another study Zhao and Wolfram (2015) investigated the acceptance of LIS journals on Twitter and the results revealed that journals with the highest Twitter attention were Journal of the American Society for Information Science and Technology (2668), College and Research Libraries (1730), and Scientometrics (625). The study also observed a significant but moderate positive correlation between the Twitter mentions and rating of the total importance of a scientific journal (Eigenfactor scores). Importance of a journal for scientific community is measured by Eigenfactor which uses the origins of all citations and frequency on how often the content on the journal would be accessed by researchers (Bergstrom, 2007).

In another large-scale multidisciplinary study, Costas, Zahedi, and Wouters, (2014) discovered that research papers had more coverage (13.3 percent) on Twitter than several other social websites, including Facebook, blogs, Twitter, Google+, and news outlets. Furthermore, a survey of 679 Mendeley users showed that the primary motivation for adding articles to Mendeley library was to cite them later (Mohammadi, 2014). Another research on Twitter showed that articles are mainly posted on Twitter by scholars themselves for publicizing purposes (Thelwall, Tsou, Weingart, Holmberg, & Haustein, 2013) Articles with funny and light titles and common social topics were also more tweeted (Didegah, Bowman, Bowman, & Hartley, 2016; Neylon, 2014).

In Sweden, like many other parts of the world, altmetrics is a prevalent topic among librarians and LIS scholars, with rapid growth. There are some indications that active engagement by librarians promotes altmetrics among their peers. Hence, the focus of this study is to survey the visibility of their efforts on behalf of article publications.
4 Theory

4.1 Introduction to the theoretical perspectives

Theory prepares a framework for the conception of social phenomena, and it can also be used to explain research findings (Bryman, 2016, p. 20). It is therefore necessary to present theoretical concepts that inform the research ideas and the design of this study.

In general, what is still lacking is a specific set of theories and frameworks to define altmetrics functions and applications. Haustein, Bowman, and Costas (2015) attempted to apply existing citation and social theories to different altmetrics platforms. A theory-guided approach for this study is based on the analysis by Haustein, Bowman, and Costas (2015). This study will apply two different theories: the normative theory of Merton’s norms and social constructivist theory.

To be able to explain the underlying acts of altmetrics, Haustein, et al. (2015) argue that common normative theory and social constructivist theory might be helpful. The strong relationship between altmetrics and citation is the main reason to employ a theoretical framework by applying normative and social constructivist approaches to social media metrics. Moreover, to understand the nature of social media, other aspects of social constructivist theory are considered via a discussion of social capital, attention economics, and impression management. Considering the journal article as the dominant type of academic document, the above-mentioned theories were used to analyse acts such as saving to Mendeley or sharing on Twitter. These two acts based on the taxonomy that is provided on chapter 1 by Lin and Fenner (2013, p. 23) will be classified in saved and discussed categorizations. Accordingly, the online actions regarding the storage of LIS articles on Mendeley considered as a saved action and the tweeting is also assumed in discussed categorization, since LIS articles’ contents have been discussed on Twitter.

4.2 Citation Theories

Since citations support the communication of specialist knowledge by allowing authors and readers to make specific selections in several contexts at the same time (Leydesdorff, 1998, p. 5), it has always been considered essential, particularly in the context of impact metrics and research evaluation (Haustein et al., 2015). However, a complete theory of citation is still lacking (Leydesdorff, 1998). The new possibilities in scholarly communication and methods provide new opportunities for analysis and research evaluation. In addition, new forms of metrics also hold the promise of measuring beyond textual scholarly impact to include collaboration, societal impact, and valorisation. In brief, with the advancement of alternative web-based metrics, it will be possible to overcome the limitations of the established forms of academic performance and publication metrics (Wouters & Costas, 2012, p. 10). Two citation theories discussed here are the normative theory and the social constructivist theory. The normative theory of Merton’s norms and social constructivist approaches can be considered as two of the most important approaches to citation theory currently under discussion today (Cronin, 2005).
According to (Bornmann, 2008), both theoretical approaches provide a valuable base for an in-depth examination of findings obtained from studies on scientific journal articles as the most common and important type of scholarly documents and the focus in this study is on the currently captured altmetrics. What makes an application of these two theories especially appealing for an analysis of the findings of the current study is that they approach research in very different ways. It can be even argued that the normative theory of Merton’s norms has a more traditional viewpoint than the social constructivists. As a result, it could be interesting to see how these views apply to the current altmetrics context.

4.2.1 The Normative Theory of Merton’s Norms

According to the normative point of view, the behaviour of scientists is organized by social norms that explain citation patterns useful for the understanding of bibliometric measures. As Kaplan (1965) points out, the normative theory considers citations as reward tools, intellectual links, and devices for the payment of intellectual debts. Four basic norms of the ethos of science that sets norms and values for science were defined by Merton (1973), nowadays known as CUDOS: communism, universalism, disinterestedness, and organized skepticism. Merton’s “sociology of science provides the most coherent theoretical framework available” (Small, 2004, p.72) which is the basis for normative citation theory. This theory is based on assumption that author does always have to adhere to these norm and they are solely guidance for referencing behaviours (Moed, 2005). Merton’s from a Mertonian perspective, citation analysis can be considered as a methodology for the historical and sociological analysis of the sciences. “The citation is then considered as a reward and thus an indicator of the credibility of a knowledge claim” (Leydesdorff et al., 2016, p. 12).

Based on Merton’s idea, the norm of communalism (Merton, 1973), or as he later promoted, the communality of scientific knowledge, which leads to common ownership of scientific knowledge and publication as means for distributing this knowledge. In his idea, science is a global collaborative activity where scientists will stand on each other’s shoulder and build on each other’s ideas. In term of universalism, Merton explained that “finds immediate expression in the canon that truth-claims, whatever their source, are to be subjected to pre-established impersonal criteria” (Merton, 1973, p. 210). Therefore, this norm determines that all scholars not only be partly responsible for scientific output but are expected to assess the works of others aside from non-scientific specifications like race, nationality, culture, or gender (Haustein, Bowman, & Costas, 2015, p. 381). In other words, since the goal is to create a quantitative body of knowledge about the world we are living in, all the scientists involved in a project should be considered as contributors. Rejecting another scientist because of who he/she is a textbook example of breach of the universalism (Stemwedel, 2008).

Regarding the disinterestedness norm, scholars’ activities should result in something that benefits all scientific society instead of individual professional gain for the scholar himself (Haustein, Bowman, & Costas, 2015, p. 381). The principle of disinterestedness demands that work of scientists remains uncorrupted by self-interested motivations. It precludes the pursuit of science for the sake of riches, though Merton recognized the powerful influence of competition for scientific priority. He carefully distinguished between personal altruism and the institutional mandate in favour of disinterestedness (Anderson et al., 2010, p. 369).
Merton’s final norm is organized scepticism. It focuses on questioning research outcomes, especially if the research boundaries are not well-established. This points towards difficulties with drawing conclusions, because a study is always partial and influenced by its particularities. In addition, organized scepticism refers to the belief in the academic world that current state of their discipline can and should be challenged continuously (Macfarlane & Cheng, 2008, p. 69).

According to Merton, the “Matthew effect” can be defined as a psychosocial mechanism that leads to the misallocation of credit in the rewards system of science. Papers written by eminent scholars tend to get disproportionate credit, while relatively unknown scientists tend to get relatively little credit for contributions of the same quality (Merton, 1973, p. 442). In other words, when a paper is cited, other authors see this, heightening their interest in the paper and the likelihood of their citing it at some later date. In this sense, citation acts like expert referral (Small, 2004, p. 75). Price (1976) presented the Matthew effect in mathematical perspective and proposed calling it the cumulative advantage or success breeds success, saying that the number of citations increases the probability of being cited. Basically, papers that have not developed along certain lines are not properly cited.

The Matthew effect is the strongest tool for explaining the concentrations and inequality of events in social media across publications due to the networked nature of these platforms. Considering this networked nature, Twitter and Mendeley are to some extent built around the Matthew effect. “The documents with more event get higher visibility with the platforms through different mechanisms.” (Haustein et al., 2015, p. 398)

4.2.2 Social Constructivist Theory

According to the constructivist perspective, citation behaviour is influenced by other factors linked to the social and/or psychological sphere that do not allow any statistical inferences that are useful for interpretation (Riviera, 2015, p. 1178).

The social constructivist’s opinion of citation behaviour has its roots in a sociological view of science, which questions normative assumptions as well as reliance on citation analysis. They believe that the cognitive aspect of an article does not affect the way it is perceived. In their opinion, scientific knowledge is produced by strategic negotiations over political and financial resources, using rhetorical tools (Bornmann & Daniel, 2008, p. 49). There are three primary sources of distortion or bias in this theory: persuasion hypothesis, perfunctory citation and negational citation (Haustein, Bowman, & Costas, 2015).

In the term of the persuasion hypothesis, much influenced by Gilbert’s, citations are one rhetorical device that scientists employ to provide support for their papers and convince readers of the validity of their claims (White, 2004). The social constructivist viewpoint maintains that citation practices uphold current patterns of institutional categorization and bolster the authority of the authors and their arguments. “This view suggests that the factors that influence citations have more to do with the location of a cited paper’s author within the stratification structure of science than with the intellectual content of the article itself” (Ibid, p. 95). According to White (2004), when authors are writing papers, they may decide to cite based on whether a paper is
"important and correct" or "erroneous" rather than on the content of the article itself, a focus that may also lead to avoiding the citation of "trivial" and "irrelevant" sources. "It implies that lower-status citers invoke writings by higher-status citations to impress readers even when those writings are not strictly relevant" (Ibid, p. 96).

As (Latour, 1987, pp. 33-34) states, in order to put up a persuasive front, author essentially fake their scholarship: "First, many references may be misquoted or wrong; second, many of the articles alluded to might have no bearing whatsoever on the claim and might be there just for display; third, other citations might be present but only because they are always present in the author’s articles, whatever his claim, to mark affiliation and show with which group of scientists”. He classified these citations as perfunctory citations. Namely, perfunctory citations are unimportant, without detail, unnecessary and potentially inaccurate (Haustein, Bowman, & Costas, 2015).

A negational reference (citation) explains “the situation when the author of the citing paper is not certain about the correctness of the cited paper” (Murugesan & Moravcsik, 1978, p. 141). Negational citations are divided into two types. The writer of the paper may claim, based on evidence or different well-established methods, that the original citation is incorrect. Or the writer of the article questions the original paper but cannot refute its claims, given that conclusions are still tentative – and until now, there is no clear separation between citing these two types of text (Ibid).

From a social constructivist perspective, scientific work can be considered as a social construct. It is thereby not possible to separate it from social and personal influences, and therefore metrics can be polluted by “noise”, calling into question the significance of the captured acts in these metrics. In addition to this, technology itself continuously changes, introducing a new set of challenges with interpreting these metrics. (Ibid)

Researchers who study the interaction and communication between the agents and results of computer-mediated environments use a wide range of theories from economics, psychology, anthropology, and sociology to make sense of these interactions and communications. Broadly speaking, social constructivism demands that analytical frameworks or paradigms be used to examine social phenomena. (Harrington, 2005, p. 1).

Therefore, in this section, a few selected theories will be investigated to provide a better understanding of the online activities upon which metrics are based, using theories of social capital, attention economics, and impression management.

### 4.2.2.1 Social Capital

The social capital theory has attracted a lot of attention in different disciplines. People are embedded in the social networks that they form, and these networks affect their lives. Social capital implies that people well-equipped with social resources – defined as their social network, with resources that they can call upon – better succeed in attaining their goals. It is also argued that people will invest in relationships in view of the prospective value of the resources made available by these relations (Flap & Völker, 2004, p. 6). Lin (2008) defines social capital as “investment and use of embedded resources in social relations for expected returns’ or ‘resources that can be accessed or
mobilized through ties in the networks” (Lin, 2008, p. 51). Van der Gaag and Snijders (2004, p. 200) define individual social capital as “the collection of resources owned by the members of an individual’s personal social network, which may become available to the individual as a result of the history of these relationships”.

Bourdieu (1985) was the first sociologist to recognize social capital as one of three types of capital in social relations: economic, cultural, and social. Social capital can be thought of as a source of power that can be accrued through connections in a social network; actors in networks establish and maintain relationships with other actors in the hope that they may benefit in some way from these relationships (Haustein et al., 2015, p. 385)

Bozionelos (2014, p. 288) used social capital theory to examine career paths in the Greek academic system and found that social capital “determines careers within that system”. In social media research, several researchers (Hofer & Aubert, 2013; Steinfield, Dimicco, Ellison, & Lampe, 2009; Valenzuela, Park, & Kee, 2008) have used social capital theory to discuss aspects of interaction on different internet platforms.

Social capital, on the other hand, has been used to study youth behaviour problems, families, schooling, public health, education, political action, community, and organizational issues namely job and career success, innovation, and supplier relations (Adler & Kwon, 2002). Social capital has become “one of the most popular exports from sociological theory into everyday language” (Portes, 1998, p. 2).

**4.2.2.2 Attention Economics**

Attention economics is a new branch of economics, which treats the individual’s attention as a resource (Goldhaber, 1997; Pope, 2007). The development of attention economics stems from the rise of the information industry (Essig & Arnold, 2001; Evans & Wurster, 1997). Simon (1971) was perhaps the first person to articulate that the world is full of information, creating the need for attention regulation for the information consumer.

In the pre-information age, most items of exchange in the economic system were physical. In the information era, we also exchange items of information. These items of information can lead to immense wealth (Brynjolfsson & Oh, 2012). But production and consumption of information have some significant points of difference from the world of material trade (Yu & Kak, 2014, p. 229).

Recently Simon’s characterization of information overload as an economical problem has gained popularity, leading business strategists such as Davenport or Goldhaber have adopted the term “attention economy” (Davenport & Beck, 2001).

The attention economy, which focuses on how information is allocated among content and people, also plays a prominent role in the world of academia. Attention is often the currency in academe; we publish to get the attention of others, we cite the work of colleagues so that they receive attention, and we cherish the prominence of great work because of the attention it garners (Franck, 1999; Klamer & Dalen, 2002). This is an
old phenomenon that has been taking place since the establishment of learned societies and academic disciplines, but it is only recently that the subject has taken on new meaning, given the opportunities of new digital mediums (Huberman, 2013, p. 329).

Moreover, researchers have used this theoretical framework to analyse behaviour on social media platforms. Rui and Whinston (2011, p. 322) studied about 3 million Twitter users and realized that social media environments are a “marketplace where people contribute information to attract attention and contribute attention while consuming information”. As a framework for evaluating novelty and popularity on social media networks, attention economy has been used to investigate (Huberman, 2013) the strategies for retaining the attention of law students in distracting and media-rich classroom environments (Matthews, 2012).

4.2.2.3 Impression Management

Individuals concern themselves with the images that others hold of them. Impression management allows individuals to conform to social norms, avoid blame or gain credit, maintain or enhance their self-conception, and strategically wield power and social influence (Tedeschi, 2013). The term impression management is associated with the work of the influential sociologist, Erving Goffman. It is central to his dramaturgical approach, in which social interaction is analysed as a set of theatrical performances. Impression management is an overarching term that characterizes the wide variety of strategies used by people to control the ideas others have about them. It is concerned with the general ways in which people present themselves in public settings (Manning, 2005, p. 397).

Most concepts of impression management and self-presentation in the literature are based on Goffman’s description. Gosling and his colleagues (Gosling, Gaddis, & Vazire, 2007) found that the level of accuracy in determining another person’s personality using information on Facebook is very limited. Users enhance their self-presentation. On the other hand, Weisbuch and colleagues (Weisbuch, Ivicevic, & Ambady, 2009) showed that users’ impressions on Facebook and face-to-face meetings were very similar. Gilpin (2011, p. 234) found that tweeting plays a crucial role in impression formation, “as followers will primarily draw conclusions based on the contents of tweet messages as well as indications of the intended recipients of those messages”.

4.3 Application of theories to Altmetrics

The current discussion of altmetrics includes a debate about whether altmetrics measurements are good representations of societal impact (Bornmann, 2014b), early scientific impact (Eysenbach, 2011), attention and educational and practical usage (Mohammadi et al., 2015; Zahedi, Costas, & Wouters, 2014). Some believe that altmetrics solely reflect buzz and popularity, and are therefore merely representations of increased visibility (Colquhoun, 2014). But the role of altmetrics depends on various platforms, their users, and topics of discussion, and the context of metrics.
To explain the underlying basis of altmetrics, common citation theories were developed to examine social media behaviour. The strong relationship between citation and altmetrics was the main reason for the use of a wide range of theories such as normative of Merton’s norm or social constructivist theory (Priem et al., 2010; Priem, 2014). Three more theories were used to describe and interpret online citation practices based on the nature of social media platforms, social capital, attention economics, and impression management. Considering journal articles as the most common type of scholarly document, various theories are applied to some acts on these platforms as a method of investigating the value of these theories.

As mentioned earlier, Matthew effect has a huge capability for explaining the concentration and skewness of online citation practices in a wide range of publications, due to the connected nature of these social media platforms. Platforms such as Twitter and Mendeley provide required processes that can be linked to Matthew effect and preferential attachment. Documents with more shares, likes and the highest number of saves will get more public exposure on these platforms. This makes Matthew effect an essential tool for observing the behaviours and activities in social media metrics, offering special insight into the reward and communication systems of science.

Three more theories can be used to understand user’s behaviours on social media platforms: social capital, attention economics, and impression management. These can be used as different lenses for understanding different aspects user behaviour. From the social perspective, social capital explains how engaging with social networks can benefit scientific communities by offering them new resources. Attention economy allows for an examination of how the scientific community figures out how to use social media to minimize the time spent on searching and finding information sources. The last theory, impression management, provides scholars with methods of actively maintaining their online presence, controlling the grey area between public and private life on social media (Haustein et al., 2015).

As a result, normative and social constructivist theories are introduced as a way of interpreting altmetrics data. The dynamics between altmetrics and citation is the main reason to begin a theoretical discussion of social media metrics using normative, social constructivist theories. (Priem et al., 2010; Priem, 2015).

Due to the social nature of these platforms, three social theories were used to understand these events: social capital, attention economics and impression management. Focusing on the most common form of the scholarly document, the journal article, these theories will be applied to two main acts, saving on Mendeley and citing on Twitter, to interpret the numerical findings of this study.
5 Method

To fulfil the purpose of this study, and to answer the three research questions, this section will clarify both the method of data collection and data analysis. Furthermore, the ethical considerations embedded in data collection and use will be discussed at the end of the chapter. The focus of the study is to capture the altmetrics score of research articles in the field of LIS parallel, as well as amassing demographic data on users who downloaded and shared articles. Both the data used to answer the research questions and the methods used to gather and analyse this data fit with these larger objectives.

5.1 Method of Choice

The current study should be considered as a quantitative study. It presents altmetrics indicators across the scientific field of LIS. These metrics have already been used successfully by other researchers (Costas, Zahedi, & Wouters, 2015). Since altmetrics measures how people interact with a given scholarly work, the aim is to measure web-driven scholarly interactions, such as how often research is tweeted, blogged about, or bookmarked (Howard, 2012; Robinson-García et al., 2014). As one of today’s extensively employed analytical tools, altmetrics have been used fruitfully in a wide variety of research applications in library and information science (LIS). As in other fields, altmetrics has been used in LIS as a quantitative research method in recent years.

5.2 Data Collection

The material used to answer the research questions were obtained from two different sources. First, to achieve a comprehensive sample of publications, SwePub was used as the main source of data collection. SwePub is a database that currently contains references to research publications at approximately 40 Swedish universities ("About Swepub," n.d). The database is a search service and to use data for statistical analysis, data needs to be refined. All publications with at least one author from Swedish universities are indexed in this database ("About Swepub," n.d).

The library and information science field can be classified in different ways. The delineation used in this paper is the one applied by SwePub according to Swedish classification. All publications recorded in the database under the research subject “library and information science” between 2013 and 2017 were selected for analysis. Chart 5.1 shows the distribution of English LIS articles in Sweden from 2013 to 2017, derived from SwePub. The advanced search options were used to retrieve all articles indexed by SwePub. The results were limited to research articles in English (removing reports, editorials, book review, etc.). The publications are limited to this period to facilitate efficient comparisons and are recent enough to attract social web mentions. The total number of articles indexed using the above-mentioned criteria results in 170 research articles. Moreover, as Hammarfelt (2014) mentioned, altmetrics data on Swedish language publications is uncommon and for this reason, this study is limited to English language articles.
As a second step, “Altmetric Explorer” is the best choice for gathering data, considering its ability to collect data on articles from different sources (https://www.altmetric.com/). It offers open data for individuals, including a free bookmarklet to be used on recent scholarly articles to see how much attention they have received online. The Altmetric Explorer provides data from social media sites like Twitter, Facebook, and Google plus, as well as online reference managers like Mendeley and CiteULike, even incorporating information from blog posts and popular newspapers like New York Times, which are considered as an evidence of public interest (https://www.altmetric.com/). Collected data from these sources is measured to calculate a final “altmetric number”.

Out of 745 publications, 170 were peer-reviewed journal articles written in English. A prerequisite for retrieving data from Altmetric.com is that the article has a digital object identifier (DOI). For some articles the DOI number was given in SwePub which was not always accurate and in some cases, missing. Therefore, it was necessary to assign DOI numbers before the Altmetric Explorer was applied individually. Each of these 170 publications was manually checked, and 68 articles without a DOI were omitted. Consequently, altmetrics could only be measured for a small proportion of journal articles.
Table 5.1. Publication types and number of publications indexed in the category of ‘Library and Information Science’ in the SwePub database, 2013-2017 (Accessed, 2018-06-25)

<table>
<thead>
<tr>
<th>Type of publication</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>Nr. Of publications</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal articles</td>
<td>36</td>
<td>34</td>
<td>47</td>
<td>71</td>
<td>58</td>
<td>246</td>
<td>33.0 percent</td>
</tr>
<tr>
<td>Conference paper</td>
<td>56</td>
<td>48</td>
<td>46</td>
<td>46</td>
<td>28</td>
<td>224</td>
<td>30.1 percent</td>
</tr>
<tr>
<td>Review</td>
<td>5</td>
<td>17</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>32</td>
<td>4.3 percent</td>
</tr>
<tr>
<td>Other publication</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>11</td>
<td>5</td>
<td>32</td>
<td>4.3 percent</td>
</tr>
<tr>
<td>Book</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>8</td>
<td>1.1 percent</td>
</tr>
<tr>
<td>Book chapters</td>
<td>20</td>
<td>22</td>
<td>18</td>
<td>21</td>
<td>16</td>
<td>97</td>
<td>13.0 percent</td>
</tr>
<tr>
<td>Editorial collection</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>8</td>
<td>1.1 percent</td>
</tr>
<tr>
<td>Doctoral thesis</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>15</td>
<td>2.0 percent</td>
</tr>
<tr>
<td>Report</td>
<td>23</td>
<td>19</td>
<td>13</td>
<td>13</td>
<td>10</td>
<td>78</td>
<td>10.5 percent</td>
</tr>
<tr>
<td>Artistic work</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0.3 percent</td>
</tr>
<tr>
<td>Research review</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0.3 percent</td>
</tr>
<tr>
<td>Editorial proceedings</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0.1 percent</td>
</tr>
<tr>
<td>All publications</td>
<td>150</td>
<td>155</td>
<td>142</td>
<td>171</td>
<td>127</td>
<td>745</td>
<td>-</td>
</tr>
</tbody>
</table>

For the next step, the collected data was categorized based on different factors. The Twitter users were grouped by nationality and profession. Four groups of users have been classified based on their profile information on Twitter: librarian, researcher, organization/bots, and the general public. In this category, organization and bots include some Swedish universities or publications that shared articles. Since a bot can do most human tasks using Twitter APIs, some organizations used bots to share data and information with their followers and the general public. In this study, bots can be representative of organizations and are, therefore, placed in this group.

In the case of the collected data from Mendeley, readers were divided into three different groups based on online profiles, including researchers (which encompasses all readers with an academic title, PhD students, masters students and professors), librarians, and members of the general public (unspecified and others).

In term of nationality, in both Twitter and Mendeley, users were categorized based on being Swedish or not. Mendeley uses IP address of its user to decide their location and this information was used to decide whether the main author resides in Sweden or not. In case of twitter the profile information of the user was used to decide the location. Since this study mostly focus on the Swedish LIS research articles, the most important point is to know how these articles distributed by Swedes. Accordingly, this study does not go to details for other nationalities.
5.3 Data Analysis

To retrieve articles with online impact, the Altmetric Explorer (Trueger et al., 2015) was used. Because, as mentioned above, this tool needs a DOI to gather data, 68 records without DOI were omitted, and the number of collection went down to 102 articles. After checking each article manually, 33 DOIs had no matches in the Altmetric database. 69 Altmetrics scores were written in excel file. Additionally, the collected data was doublechecked using the Altmetric API, and the result was the same. In this study, Excel was used to analyse and present data. Univariate analysis was used to display the result, which refers to the analysis of one variable at a time (Bryman, 2016, p. 336). As Bryman (2016, p. 337) argues, diagrams are among the most frequently used methods of displaying quantitative data. Their chief advantage is that they are relatively easy to understand. Since the variables in this result were nominal, a bar chart and a pie chart are used to visualize the findings.

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of articles without DOI</td>
<td>11</td>
<td>11</td>
<td>7</td>
<td>19</td>
<td>20</td>
<td>68</td>
</tr>
<tr>
<td>No. of unindexed articles in Altmetric database</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>11</td>
<td>33</td>
</tr>
<tr>
<td>No. of Indexed articles in Altmetric database</td>
<td>6</td>
<td>4</td>
<td>12</td>
<td>28</td>
<td>19</td>
<td>69</td>
</tr>
<tr>
<td>No. of articles in Swepub</td>
<td>18</td>
<td>20</td>
<td>28</td>
<td>55</td>
<td>49</td>
<td>170</td>
</tr>
</tbody>
</table>

5.4 Ethical Issues

The data used in this study was obtained from Altmetric.com which facilitates tracing each research article on different platforms such as Facebook, Twitter, Mendeley, CiteULike, and blogs.

Social media services help like-minded people to get together and form online communities where they can discuss their topics of interest and share experiences. When it comes to researching online activity, privacy is always a challenging issue. Does someone have the right to monitor social media users? Who is in charge of people’s online privacy? And where are the boundaries for researchers interested in collecting and analysing data from these kinds of environments? (Liu, 2014).

According to Bryman (2016) researching by using the Internet as a platform for collecting data increases specific ethical issues. The continual emergence of new platforms prompts new questions, as researchers attempt to understand the continually changing ethical, legal, and practical implications of using data collected online (Bryman, 2016, p. 139). The ethical aspect of this study focuses on questions about users’ lack of knowledge about their privacy and usage of the data they have made available on different social media platforms. In some cases, users might have accepted that what they share on social media can be accessed by people and organizations without their knowledge. In the case of Mendeley, users might not even be aware that their data will be analysed by 3rd parties. Livingston (2005) believes that if specific
criteria met, the online date can be used for purposed research. One criterion is that the information should be accessible by public and publically archived. Information should be open and not sensitive in nature. Therefore all gathered data from Altmetrics.com is in compliance with Livingston’s criteria.

In addition, as Konkiel (2017) states, it is not solely dependent on the single individual to protect his/her rights for privacy. Those using altmetrics must ensure that user privacy is considered. This approach requires that individuals be given the chance to decline participation, wherein their data will be deleted or hidden. One example would be when people limit access to their social network profile (by increasing privacy settings); altmetrics researchers would then need to update their database and remove the relevant posts. Consequently, the author is confident that the data used in this study does not violate ethical standards in any way and can be used for the current study without obtaining informed consent.

5.5 Reliability and validity

Currently, bibliometric studies use external resources such as publisher to collect data, like Web of science provided by Thomson Reuter. Same goes for collecting data for this study with a slight tweak that now social media platforms are the source of the collected data. This introduces two major challenges on the reliability of collected data, which can be expected on all altmetrics studies. Firstly the transparency of the source of the data and methods of accessing it and secondly collectors of these data such as altmetric.com which will add to the complexity (Peters, 2016). Since this study also aimed to conduct on altmetrics area, there might be questions about the validity and reliability. As Bryman (2016) mentioned, reliability is based on the question of whether the findings of a study can be repeated. This study used two main websites to gather data (SwePub and Altmetric.com), and it should be taken into consideration that the nature of their databases is dynamic and update over time. In the case of altmetric.com as mentioned in the limitation part of this study, data can be removed, changed or added. This scenario can happen in SwePub database. Even though the method of this study is repeatable, but this should be taken into account that both websites are updating all the time and this fact may affect the future findings which is inevitable. For this reason as Bryman (2016) stated, the date of accessing the data is always recorded in this study to freeze the selected data set and this is common practice among researcher when faced with ever-changing online resources. This ever-shifting landscape produces a treat to the repeatability of not the method but the outcome of future studies. Due to the dynamic nature of the online data there is no means to validate the collected data which introduced validity concerns about the study in general (Ibid). Author’s approach was to filter out the sources for these type of data set to make sure that at least the selected sources are reliable as yet another way to increase the quality of research.
6 Results

The results presented in this chapter were based on the obtained data from the Altmetric Explorer, using a login to collect required data (explorer login). The chapter is divided into three sections. The first section (6.1) focuses on the altmetrics coverage of LIS articles. The second section (6.2) of the chapter presents the demographic data of people who used and shared these articles in LIS. The last section (6.3) attempts to highlight the main themes of LIS research in Sweden.

6.1 Altmetrics coverage of articles

Mendeley had the best coverage of altmetrics data sources with 65 percent of the articles having at least one reader (Fig. 6.1) A little more than 33 percent of the articles were mentioned on Twitter, a handful of articles were mentioned on Facebook, and of the total 53 articles, none were mentioned on blogs or CiteULike. On average, the articles had around 23 readers in Mendeley, while the average of tweets was 12.


Only 1 percent of the articles had citations in NewsOutlet (table 6.1). Altmetric automatically searches through a massive collection of news outlets to gather information on the online presence of scientific documents referenced in main news
outlets and magazines ("Mainstream Media Outlets," n.d). In order for the system to work it needs to go through RSS feeds by mining a selected list of RSS feeds from news websites or adds new sources one-by-one the system works (Ibid). “RSS stands for Really Simple Syndication or Rich Site Summary. Websites create RSS feeds of their content as a way to provide continuous updates to subscribers about the material they are hosting” (Dubuque, 2011, p. 63). In simple term RSS is a communication channel for the users’ of a particular website to access to updated information as it made available on internet in standard format (Ibid).

Table 6.1. Articles having readers in NewsOutlet

<table>
<thead>
<tr>
<th>Article</th>
<th>Author</th>
<th>Publication Year</th>
<th>NewsOutlet Readers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No evidence of publication bias in climate change science</td>
<td>Harlos, C</td>
<td>2017</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Edgell, T.C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hollander, J</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender differences in research performance and its</td>
<td>Van den Besselaar, P</td>
<td>2016</td>
<td>1</td>
</tr>
<tr>
<td>impact on careers a longitudinal case study</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sandström, U</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The altmetrics data for these articles is as follows: texts have been mentioned 819 times in 777 tweets, 10 blogs posts, 14 news articles, 1 Wikipedia entry, and 17 Facebook posts. In addition, the total altmetrics score for these articles is 768, an average of 14 per article (Fig 6.2).

![Fig. 6.2. Altmetric scores of journal articles with DOI, 2013-2017. (n = 69)](image-url)
Despite the fact that there were 33 articles which were not indexed in the Altmetric database, there was one article with a score of 280 written by (Harlos, Edgell, & Hollander, 2017). Fig 6.3 and 6.4 show who shared this article on twitter and read it on Mendeley. It seems that the authors of this article are biologists and their article is not related to LIS, but SwePub have indexed it as an LIS text. The point that should be considered is that most keywords used by the SwePub database are chosen by authors and therefore could be indexed in a variety of ways (multidisciplinary). Moreover, due to the statistical numbers in altmetric.com, this paper has been read most by earth and planetary scientist (19 percent). Social scientists account for a mere 15 percent or readers, meaning that this paper could be barely related to LIS.

![Twitter demographic of the article with the highest altmetric score](image)

**Fig 6.3. Twitter demographic of the article with the highest altmetric score**

![Mendeley readers of the article with the highest altmetric score](image)

**Fig. 6.4. Mendeley readers of the article with the highest altmetric score**
6.2 The demographic information of people who share and read LIS articles

This section is divided in two. The first part focuses on people who read LIS articles in Mendeley, and also discusses the population distribution of Mendeley users. The second part covers the demographic data for people who share LIS articles on Twitter.

To create a better picture of these readers, they are categorized as Swedish or non-Swedish, based on their provided nationalities.

6.2.1 Who reads LIS articles in Sweden?

The academic social web site Mendeley is a platform for users to manage scholarly references, create online profiles, and communicate with peers. Mendeley provides the academic status of readers for each document, making it possible to distinguish the readers’ possible occupations and academic levels (Mohammadi, Thelwall, Haustein, & Larivière, 2015). In this study, readers were separated into three different groups: researcher (which consists of all readers with academic title and students), librarian, and general public.

Figure 6.5 shows that in LIS, researchers were the main Mendeley readers between 2013 to 2017, representing 53 percent of the total, followed by the general public, who account for 26 percent of total readers. However, one should keep in mind that all of the professions are self-reported and based on the information provided by each individual on Mendeley.

Fig. 6.5. Readers of LIS articles in Mendeley based on their status between 2013-2017
In order to deal with readers’ geographical distribution, data was collected from the Altmetric database. Fig 6.6 presents the readers’ geographical distribution. This figure shows that the minority of the readers originate in Sweden (1 percent). Focusing on the level of international distribution of papers, it is interesting to note that majority of articles were read in other countries, potentially representing Mendeley’s lack of popularity among Swedish scholars.

6.2.2 Who Shares LIS Articles in Sweden?

Since Twitter is a popular microblogging and social networking service with approximately 330 million active members, this study tries to pinpoint the audience for LIS articles shared on Twitter. In order to have a better understanding, four groups of users have been identified based on their Twitter profile information.
Figure 6.7 shows that in the field of LIS, public users were the main group that shared articles from 2013 to 2017. Researchers were the second group that shared LIS articles on the platform. The next group is organizations and bots, which includes some Swedish universities or publication companies that shared articles. One should consider that the growing user population and open nature of Twitter have made it an ideal target for exploitation for automated programs, known as bots. Like bots on other web applications (i.e., Internet chat, blogs), Twitter bots have gained popularity. Since Twitter does not strictly police automated services on its platform, after acquiring login information, a bot can perform most human tasks by calling Twitter APIs (Chu, Gianvecchio, Wang, & Jajodia, 2012). Some organizations also took advantage of implementing bots to share information with their followers and the general public. In this study, bots are categorized in the same group as organizations. In this study bots were mostly commercial and created by publishers and different organizations. Therefore they are categorized on the same group.

![Swedish vs Non-Swedish Users](image)

**Fig. 6.8. Nationalities of people who shared LIS articles between 2013-2017**

To recognize the nationality of users who shared LIS articles on Twitter, data was collected from the Altmetric database. Fig 6.8 presents the users’ geographical distribution on Twitter. It shows that minority of the users were in Sweden (9 percent), the other 91 percent were either from other countries or had not declared their country of origin - far from uncommon among Twitter users. Focusing on the level of international distribution of papers, it is interesting to note that non-Swedish people shared most of articles.

### 6.3 What topics are most often mentioned

The last part of the findings focuses on the topics that were mentioned more often on Twitter. In order to provide some insight into the properties of journal articles with a high altmetric score of 10 tweets or more were singled out for further study.
Table 6.2 presents the list of articles with a high number of tweets between 2013 and 2017. It shows that most topics are associated with bibliometrics and citation impact. This table indicates that these two topics were prevalent themes in LIS in Sweden during this period. Moreover, many of the highly read papers were written by two or more authors, and many of them can be considered as interdisciplinary. This means that this group of articles was indexed in several domains across the social science and the natural sciences.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Title</th>
<th>Mendeley readers</th>
<th>Twitter mentions</th>
<th>year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harlos, C. et al.</td>
<td>No evidence of publication bias in climate change science</td>
<td>23</td>
<td>220</td>
<td>2017</td>
</tr>
<tr>
<td>Hammarfelt, B. et al</td>
<td>From Eminent Men to Excellent Universities: University Rankings as Calculative Devices</td>
<td>18</td>
<td>72</td>
<td>2017</td>
</tr>
<tr>
<td>Eriksson, J. et al</td>
<td>Moving towards open science?</td>
<td>4</td>
<td>23</td>
<td>2017</td>
</tr>
<tr>
<td>Ahlgren, p. et al</td>
<td>Exploring the Relation Between Referencing Practices and Citation Impact</td>
<td>8</td>
<td>13</td>
<td>2017</td>
</tr>
<tr>
<td>Lindh, M &amp; Nolin, Jan</td>
<td>Information We Collect Surveillance and Privacy in the Implementation of Google Apps for Education</td>
<td>38</td>
<td>113</td>
<td>2016</td>
</tr>
<tr>
<td>De Rijcke, S. et al</td>
<td>Evaluation practices and effects of indicator use : a literature review</td>
<td>87</td>
<td>17</td>
<td>2016</td>
</tr>
<tr>
<td>Nilsson, I.L</td>
<td>Developing new copyright services in academic libraries</td>
<td>9</td>
<td>14</td>
<td>2016</td>
</tr>
<tr>
<td>Schmidt, N</td>
<td>Tackling complexity in an interdisciplinary scholarly network: Requirements for semantic publishing</td>
<td>7</td>
<td>17</td>
<td>2016</td>
</tr>
<tr>
<td>Sundin, O &amp; Carlsson, H</td>
<td>Outsourcing trust to the information infrastructure in schools</td>
<td>14</td>
<td>11</td>
<td>2016</td>
</tr>
<tr>
<td>Hammarfelt, B. et al</td>
<td>The heterogeneous landscape of bibliometric indicators</td>
<td>30</td>
<td>12</td>
<td>2016</td>
</tr>
<tr>
<td>Karimi, F. et al</td>
<td>Mapping bilateral information interests using the activity of Wikipedia editors</td>
<td>8</td>
<td>65</td>
<td>2015</td>
</tr>
<tr>
<td>Van Den Besselaar, P &amp; Sandström, U</td>
<td>Early career grants, performance, and careers : A study on predictive validity of grant decisions</td>
<td>40</td>
<td>32</td>
<td>2015</td>
</tr>
<tr>
<td>Lindahl, J. et al</td>
<td>Trends and knowledge base in sport and exercise psychology research : a bibliometric review study</td>
<td>19</td>
<td>12</td>
<td>2015</td>
</tr>
<tr>
<td>Āström, F &amp; Hansson, J</td>
<td>How implementation of bibliometric practice affects the role of academic libraries</td>
<td>82</td>
<td>10</td>
<td>2013</td>
</tr>
</tbody>
</table>
Journals such as climate change or International Review of Sport and Exercise Psychology in which these articles were published are not intuitively indexed as LIS texts. The inclusion of these articles is probably due to the fact that researchers themselves index their publications in SwePub, and collaborations between scholars in and outside LIS were then indexed in several domains.
7 Discussion and Conclusion

This study aimed to trace the visibility of LIS academic papers in order to assess not only the research impact of these texts, but to investigate to what extent this research is visible for different target groups and, specifically, for librarians. To achieve this, data mined from the web and social media (Mendeley reader counts, Twitter mentions, Facebook) was used, and the following research questions will be answered:

1. What is the altmetric coverage and “impact” of academic articles published by researchers associated with Swedish universities within the field of LIS between 2013 and 2017?

2. What is the demographic makeup of the people who used and shared these articles?

3. Which research topics in LIS received most altmetric attention between 2013 and 2017?

The research questions will be discussed using the theoretical background and empirical findings of this study and where it was possible the author tried to utilise the mentioned theories to interpret the results.

The answer to the first question will focus on the data analysis and comparative analysis with other studies in this area. The answer to the second and last questions will mainly focus on theoretical perspectives. The discussion of social media activity as interpreted through the lens of normative theory of Merton’s norms and social constructivist theories will be the backbone of the discussion. Analysis will focus on two of the most relevant acts: saving a file in Mendeley and mentioning an article in a Tweet. This focus is warranted because Mendeley reader counts and tweets have been shown to be the most popular online events for research papers and that correlates to the views of Merton’s norms and constructivist theories.

7.1 Altmetric score of LIS papers

The validation and assessment of research is an interesting area for many institutions, publishers, financial supporters of research activities, and researcher themselves. The result of this study will offer a helpful overview for understanding the social impact of LIS-related papers in Sweden. Results reveal that, in the field of LIS, articles have been mentioned 819 times – mostly on Twitter, in line with the findings of Sugawara et al. 2017 or Faulkes in 2014 - blogs, Weibo— one of the leading microblogging services in China — and peer review sites. The total altmetrics score of 768, for 66 articles out of 170, results in an average of 14 per article, which means that there were 33 articles with no mentions, while there were 66 that have been considered in the virtual scholarly world. Altmetrics data are most frequent for more recent publications, particularly from 2013 to 2017. In 2013, around 9 percent of all the publications with a DOI received an altmetrics score. This share slightly decreases to 6 percent of papers with a DOI in 2014, but rises to 18 percent in 2015, to 31.8 percent in 2016, and finally to 27.2 percent in 2017. Considering all this, it makes sense to emphasize that altmetrics scores are only valid for more recent years
and have no real value when applied to older publications, as their presence in the online sphere is negligible. This is in line with previous studies (Haustein et al., 2014) that also suggest this strong “recent bias” in altmetrics scores. Besides, it is essential to take into account the fact that Altmetric.com only started to collect data in July 2011; therefore, publications from this date onward are better represented in the altmetrics database.

When it comes to online presence, Mendeley had the best coverage of all altmetrics data sources considered; 65 percent of all articles had at least one reader. Little more than 33 percent of the articles were mentioned on Twitter, and a handful of articles were mentioned on Facebook, and of the remaining 53 articles, none had been mentioned on blogs or CiteULike.

When Priem, Piwowar, and Hemminger (2012) explored a large sample of papers published by the Public Library of Science (PLoS), around 80 percent of the PLoS articles were covered in Mendeley, while 31 percent of these papers were bookmarked on CiteULike and 10 percent on Delicious, although it is not entirely fair to compare statistics between the sites, since they use and record information in different ways.

It has also been reported that Mendeley had the highest coverage among all altmetrics resources for 20,000 random publications indexed in WoS (Zahedi, Costas, & Wouters, 2014). Furthermore, Mohammadi and Thelwall (2014) found that Mendeley covered 44 percent of social science articles and 13 percent of the humanities papers from WoS in the year 2008.

A large-scale multidisciplinary study by Costas, Zahedi, and Wouters, (2014) discovered that research papers had more coverage (13.3 percent) on Twitter than on several other social websites, including Facebook, blogs, Google+, and news outlets. A later Mendeley analysis of the same set of 1.4 million PubMed papers reports that 66 percent had at least one Mendeley reader (Haustein et al., 2014). These findings seem to largely be in accordance with this study, suggesting that Mendeley has had the best coverage among social media websites and still is the most popular.

In comparison, there were fewer mentions on Twitter and blogs, confirming Hammarfelt’s results in 2014. He reckoned that Mendeley is an excellent altmetrics source for journal articles in contrast to Twitter.

It is worth mentioning that the limited coverage of publications in languages other than English is often seen as one of the main problems for evaluating LIS’ use of bibliometric methods. The use of bibliometric data from databases such as Web of Science (WoS) or Scopus is particularly troublesome for main European languages such as Spanish, French, and German, where researchers are interested to focus on national audiences (Archambault et al. 2006). Altmetrics can provide a solution as the sources used are not limited to a specific database or a set of journals. The current services, including Altmetrics.com, are mostly focused on English speaking audiences, but it would be possible to imagine that the further improvement of altmetrics methods will provide services that are more adapted to other languages, such as Chinese, French, German, and Spanish, or even Swedish.
7.2 Demographic information of who reads and shares papers

7.2.1 Who reads LIS papers in Sweden

Most readers of LIS papers in Mendeley are researchers. Perhaps the most important reason could be that Mendeley attracts researchers because they adapt better to new technologies (Mohammadi et al., 2015). Another possible explanation is probably that Mendeley is one of their first tools researchers learn about. Additionally, researchers mine the literature more than other audiences, as they try to obtain comprehensive knowledge about their research topics (Gingras, Larivière, Macaluso, & Robitaille, 2008) while librarians or public audiences perhaps read these articles to extend their general knowledge. Moreover, Mendeley is a new tool, and public users seem to avoid using new social web services (Mas-Bleda, Thelwall, Kousha, & Aguillo, 2013) and may prefer to continue with their existing referencing practices.

Members of the public who are not academics read a noticeable percentage of papers, and this is an essential issue because some articles could be useful for the general public even if they are not cited in the literature. Moreover, a noticeable fraction of papers had librarians as readers, which is consistent with the results of Schloegl and Stock (2004) and Mohammadi et al. (2015).

Perhaps most importantly, Mendeley is most useful for those who will eventually cite an article, and so its readership counts seem likely to under-represent users who will never need to cite an article, perhaps including disproportionately many practitioners (Mohammadi et al., 2015, p. 15). Moreover, there is no obvious way to categorize the three million users of Mendeley as representative of the readership of scientific documents and be sure of underlying biases regarding discipline, academic age, and the origins of authors. Focusing on social media metrics related to scientific journals, correlation with citation is specifically high in Mendeley reader counts. This opens up an opportunity to look at this data using normative theory to understand the inner workings of Mendeley. Unlike citations, that different norms of communalism, disinterestedness, organized scepticism and universalism can be applied, Mendeley users are not a perfect fit and their behaviour when collecting documents in their online libraries cannot be described by any of these norms. As shown by Haustein et al. (2015), there are no norms regarding literature management.

The value of the social constructivist theory in interpreting the act of reading articles as a pre-citation role would be difficult. Though a survey conducted by Mohammadi (2014) of Mendeley users found that the main reason to save documents in the Mendeley system was to cite them. It is not possible to expect that researchers read these LIS articles for persuasive or perfunctory reasons.

The Mathew effect could also be applied to Mendeley users by considering the cumulative advantages of access. LIS articles that have already been read and saved by researchers in Mendeley libraries are more likely to be read or saved by other users. Since these articles appear in Mendeley search results and browsing, Mendeley users would be likely to save and read more documents from the same authors and high impact journals. A study by Costas, Zahedi, and Wouters (2015) reveals that articles...
published in high-impact journals such as Nature or Science account for a substantial amount of reader counts suggesting that some kind of Matthew effect applies when documents are saved to Mendeley.

When examining the act of reading LIS articles from the perspective of social capital, this theory is well suited to explain why researchers mostly read papers in Mendeley. They probably save and read articles with the hope that they may benefit in some way from these relationships. It may have an impact on the return for a researcher, including emotional support, the exchange of information, or increasing the visibility of their own work. After all, increasing the visibility of a researcher’s work has the possibility of rising researcher’s social capital in the network. But it seems these points cannot be extended to the Swedish researcher, librarians, or even general public.

Using the theory of attention economics is another way to explain why researchers save and read more LIS articles on Mendeley. Scientists utilize technologies and new tools to navigate this vast amount of material in order to find the relevant and needed information (Haustein et al., 2015). This mirrors the findings of this study. Researchers are making use of Mendeley and, in particular, searching, storage, and organization that decrease the amount of work they will need to apply in the future.

In terms of applying impression management theory to these activities, reading articles in Mendeley requires the act of saving. It becomes clear that researchers may save their own publications in order to promote themselves, which is not the priority in case of librarians and public users. This act impresses upon others that they are accomplished in their area of study and that they fulfil the qualifications of academics.

In order to be able to accept Mendeley as a credible resource for altmetrics, one must understand that one of the limiting factors of Mendeley is their user group, a small minority of academic readers. The assumption that Mendeley users generally belong to younger age groups cannot be verified and therefore shall not be used to estimate the age range of users groups. As an example, when Mohammadi et al. (2015), refers to a user base that is 10 percent university professors and 77 percent students, one possibility might be that although professors may represent the majority of Mendeley’s users pool, in reality they do not register themselves on the website and therefore are not counted as readers, hence the wide gap between the age groups.

Furthermore, this study showed that the minority of the readers reside in Sweden (1 percent). According to Mendeley privacy policies, the site uses different measures to learn about user’s physical location, such as IP addresses and location-aware services; ("Privacy Policy," 2018). Focusing on the international distribution of readers, it is interesting to note that the majority of articles read in other countries, potentially signifying Mendeley’s lack of popularity among Swedish scholars. But the reason why this citation manager still is not popular among Swedish scholars still needs more investigation.
7.2.2 Who shares LIS papers in Sweden?

Among these two major platforms, Mendeley does not provide users with opportunity to share articles with other users. For this reason, within the context of this study, the primary platform used to share articles with larger audiences is on Twitter. The result of this study revealed four significant groups of audiences of LIS articles on Twitter: librarians, researchers, organization/bots, and the general public. Among these, public users were the largest group that shared LIS articles during the selected time frame, followed by researchers. The next group were organizations, publishers, and bots, including some Swedish universities or publications that shared articles. Librarians were the last group. Despite the fact that Swedish libraries are eager to improve their presence in the digital realm, librarians seem to stay away from using social media platforms as way of sharing academic publications with the public. Among the small number of Swedish users of Twitter, only a handful were librarians and the rest were mostly university scholars who wanted to promote their articles. One reason that these platforms are not popular among librarians and LIS scholars in Sweden might be that Twitter as a platform is not their main channel of communication, and they might have more local channels to discuss and share articles and information that would be mainly in Swedish.

The former 140 characters-per-tweet limitation on Twitter (At the time of writing this thesis, Twitter moved from a 140- to 280-character limit per tweet, and this can change the way that users cite a scientific paper on the platform.) introduced new ways of mentioning scientific papers that was not synced with formal methods of citing scientific papers and did not follow the conventional process of standardized citation. On Twitter, many papers were mentioned not because of their scientific quality but rather as a reflection of current global and local trends and interests, and this contradicts Merton’s notion of valuing knowledge claims. It seems that the originality of a paper is a marginal concern for the Twitter community.

But in this study, it could still be argued that some degree of communalism and universalism are applicable, since scientific publications are used to discuss, debate, or contrast scientific ideas on Twitter. However, findings regarding bot accounts, which automatically tweet links to scientific documents, are another example of the limitations of Mertonian norms for this type of act (Haustein, Bowman, et al., 2015), as automated diffusion cannot be considered a social act.

In Merton’s words, the communalism norm refers to the “nontechnical and extended sense of common ownership of goods” (Merton, 1973, p. 273). Particularly in the context of tweeting, the well-known idea of “giving credit where credit is due” is connected with this norm, as users probably acknowledge the value of a colleague’s work by tweeting it. Based on the findings of this study, Swedish librarians were the minority of the population who tried to share LIS articles to give credit. Since this study focused on the English-language publications, the activity of the librarians on Twitter in this language was the lowest. However, in terms of Swedish-language articles, this situation might be totally different, and it needs more investigation.

According to the Mertonian norm of universalism, “all scholars not only can be partly responsible for the science but are expected to assess the works of others aside from non-scientific specifications like race, nationality, culture, or gender” (Haustein,
Bowman, & Costas, 2015, p. 381). Accordingly, the LIS articles mostly shared by non-Swedish public users reflects this norm.

The positive attitude towards a tweeting process is an expression of the social constructivist view that scientific work is a joint effort between the scientist who produces the work and the users who tweet or re-tweet it. According to social constructivists, the motivations for citation vary and are influenced by cognitive and personality styles that may not be influenced by universalistic factors. They believe that re-tweets are also based on social and psychological influences and therefore cannot be free of personal and social biases. According to the perfunctory citation theory, many citations can be nonessential, superficial, and even wrong (Haustein et al., 2015). This study shows that there may be some perfunctory citing of LIS articles on Twitter. Since the public has tweeted the most LIS articles, it seems that researchers and librarians probably do not consider this platform as the right place to share academic information, due to the “noise” of Twitter, which may explain their low level of participation in (re)tweetering LIS articles.

Retweet functionality on Twitter can lead to an accumulation of tweets for specific scientific documents, highlighting the crucial role of the Mathew effect. Retweeting of a scientific paper increases its visibility on the platform, and this can lead to more retweets as a result. Twitter uses push notification to inform its users if the number of retweets reaches a certain level, which can in turn be an incentive for more retweeting (Satuluri, 2013). The other important factor is the number of followers, which often resulting in an increased number of re-tweets. This is especially true when a major scientific publisher tweets about an article (Haustein, Peters, et al., 2014). This is also can be the reason for LIS articles with high altmetrics scores.

If a paper gets more attention on Twitter, it gets the higher score in altmetrics. On the other hand, LIS papers with greater Twitter attention have been mentioned by users who have more followers, facilitating more tweeting.

Mathew effect can also be helpful in arguing for the fact that a mix of social capital achieves success on Twitter both on the platform (number of followers) and within the scientific community. As an example, LIS articles mentioned a lot due to their scientific importance and their citations are more likely well received on the platform as well. Examples of the success of articles published in major popular yet prestigious scientific journals such as Nature and Science is proof of this. (Costas et al., 2015; Haustein, Peters, et al., 2014).

When examining Twitter mentions from the perspective of social theory, it can provide additional insight. According Haustein et al. (2015), users may have many different motivations for mentioning a scientific document in a tweet; still, the theory of social capital recommends that one of these motivations should be to make a connection between the tweeter and the publication and, in return, the author(s) of the document. When a scholar tweets about a document, a weak link forms between this person and a broader network. As the documents get mentioned more and more, this link is strengthened, possibly leading to revenue or possible future collaboration. (Hustein et al., 2015)

This claim is discordant with the findings in this study. It seems that their audience is primarily public users who are interested in (re)tweeting LIS articles. The results
indicate that tweeting or using Twitter to share LIS articles is not a priority among librarians and scholars as a means of networking in order to find collaborators or gain visibility.

Looking at this act through the lens of attention economics indicates that the using characters provided by twitter such as @, # and URLs will reduce the amount of attention needed for accessing and understanding a paper by making information on Twitter easier to find (Haustein et al., 2015). On the other hand, Rui and Whinston (2011, p. 322) studied about 3 million Twitter users and realized that social media environments are a “marketplace where people contribute information to attract attention and contribute attention while consuming information”. Even though there are a variety of linking characters on Twitter that ease the activity of users, Swedish librarians and scholars are not interested in using this social media as a marketplace to share LIS articles and expand their influence.

Using impression management, the act of Twitter mentions can be interpreted as an attempt to present oneself as up to date on the work in their field, someone who can be trusted to read and cite relevant documents. This claim is opposed by the findings of this study. Librarians and scholars do not use Twitter as a platform to mention LIS articles, though other platforms are potentially more popular to use in Sweden. But still, this claim needs more investigation.

7.3 Which topics got the most attention in Sweden?

The last part of the findings focuses on the topics mentioned most on Twitter. Results show that most topics are associated with bibliometrics and citation impact statistics. This indicates that these two topics were the most popular themes in LIS in Sweden. Moreover, many of the highly read papers were written by two or more authors, and many of them can be considered as interdisciplinary. This means that this group of articles was indexed in several domains across the social sciences and the natural sciences. Moreover, it should be considered that the papers with multiple authors got more mentions on Twitter, strong according with the social theory. The research conducted by Haustein and his colleagues also showed that the number of authors was an important factor for altmetrics events (Haustein, Costas, & Lariviére, 2015). Although users may have various motives for mentioning a scientific document in their tweets, this theory suggests that one of these motivations might be to establish a connection between the tweeter and the publication. When a scientific document has been tweeted by a scholar, a network start to grow. Probably, scientific documents that have multiple authors are more likely to tweet, and these tweets are more likely to lead to connections that can be turned into benefits such as a collaboration or a letter of reference.

Earlier findings, like Davarpanah and Asleki (2008), show that the highest number of articles were related to information technology and to communication. Åström (2007), who examined changes in the LIS research front from 1990 through 2004, also claimed that informetrics and Internet research became more visible in current LIS research output. González-Alcaide et al. (2008) found that there were three major core research areas to be identified in LIS research areas: the World Wide Web, libraries and education. The analysis of the keywords according to Aharony (2012) revealed that
there is no remarkable difference among the three large categories: information technology (17.99 percent), methodology (17.40 percent), and social information science (17.05 percent). These findings indicate that those three subjects are the main themes of the top ten LIS journals. In contrast, in this study, bibliometrics and citation impact are the first visible topics in mainstream LIS research, but methods used for that research were entirely different from those employed in this study.

Probably one of the reasons that topics like bibliometrics and citation impact receive the most attention on Twitter is the number of followers who shared these topics. Most of the users who share these articles have so many followers that their (re)tweeting of an article has a direct effect on the altmetrics score of articles and, is in accordance with Matthew effect, this explains the concentration and skewedness of social media activity. Retweeting increases visibility, which has a snowball effect.

On the other hand, the persuasion hypothesis considers citations as mere “tools of persuasion”, used to persuade the scientific community of the value of work. According to White (2004), this persuasion could be a "dark" type of persuasion in line with social constructivist theory. Within this “dark” persuasion there are two types: “persuasion by distortion” that occurs because “citers often misrepresent the works they allude to” (White, 2004, p. 96) and “persuasion with names” that can be linked to the disproportionate citation of works by established authorities to gain credibility through association. This hypothesis also is used to argue that there may be some forms of persuasion at use in posting articles on Twitter. Most of the articles have been mentioned on Twitter by the public, and using the shortcut characters on Twitter is easy; therefore it could be said that one of the reasons that some articles are not really related to the field of LIS received outsized attention is because of this dark persuasion.

7.4 Conclusion

This work has revealed that Mendeley has the best coverage of altmetrics data sources compared with other platforms in use in Sweden. It has also clearly showed that most of the LIS articles have been read by non-Swedish researchers, and most of these articles have been mentioned by public users on Twitter outside of Sweden.

One definitive conclusion of this study is that the adoption of altmetrics methods offer in the LIS fields is inevitable. But several issues must be considered in order to understand their potential. Some patterns work against the acceptance of altmetrics methods. Scholars continue to rely on print in many disciplines, and there is still low coverage for non-English publications. Some issues that need to be taken into consideration are the new metrics, which can easily be influenced by noise (such as dark persuasions and persuasion by distortion). This noise will lead to doubt among scholars about the value and significance of these metrics. Constantly changing technology and shortcuts will introduce new challenges for understanding these metrics.

One explicit limitation of the current study was that it was difficult to track all articles in all social media channels, due to the fact that Altmetric.com currently has a limited source base in its database, namely Mendeley, CiteULike, Facebook, Twitter, and blogs. It is possible that some articles mentioned on other social media or by researchers do
not have an account in those specific platforms may affect the scores of articles. Moreover, this database only indexes articles with a DOI. Therefore, this study could not consider all articles extracted from SwedPub during the selected period 2013-2017. Another limitation that may affect the results of this study was the data quality. In Altmetric.com’s database, all information is dynamic, which means that records can be deleted, altered, or added at any point. This aspect of altmetrics results in inconsistency in the quality of the data.

The results of this study regarding the populations who read and share LIS articles shed light on the two different theories, namely normative and social constructivist theories. Even though these theories used to explain the results of this study the point is that not all findings can be explained by these theories, which was beyond the expectation of the author. Applying a social constructivist lens to this study’s data reveals that the high standards of Merton’s norms are, though perhaps old-fashioned, still valued among people involved in research. On the other hand, it also is noticeable that the constructivists’ view of human nature modifying the world of research is dependent.

Consequently, the scholarly practices of many fields may restrict the usefulness of altmetrics data. Despite the digitalization of research in LIS, a general development towards open access across research fields together with further change in and an increasing variety of altmetrics methods could partly solve the issues raised above. Similar to Hammarfelt (2014), this author believes that altmetrics has the potential to be accepted and become the main alternative to traditional bibliometric methods for measuring the impact factor of research in various academic and scientific fields among Swedish librarians and scholars. If Swedish librarians and scholars work in collaboration with Altmetric.com to expand the reach of their database and add other languages to their platform, this will in return lead to more engagement from non-English academic and scientific societies.

7.5 Suggestions for future research

The findings of this study may possibly provide inspiration for further research in the field of altmetrics in Sweden and triggers new questions. Since the LIS articles of this study were only drawn from a single database - the SwePub - therefore the findings are localised and specific. Future studies could investigate more than one database to expand the data on various topics related to Library and Information Science (LIS).

Since this study showed that mostly LIS articles shared or read by non-Swedish people, a study that aims to examine the underlying reasons that the Swedish researchers and librarians are not interested in these social platforms in detail would give a deeper insight about how Swedish researchers and Librarians share their articles. Moreover, such study could reveal if there are any other social networks which are popular among Swedish researchers and librarians.

Concerning the altmetrics coverage of articles, this study showed that Mendeley had the best coverage of altmetrics and none of articles mentioned on blogs or CiteULike. A study that focuses on the reasons behind these results would give a better understanding of the undeniable popularity of Mendeley among scholars or why these social platforms did not use by Swedish user between 2013 to 2017.
The last part of this study focused on the LIS topics that were mentioned more often on Twitter. To provide some insight into the properties of LIS articles with a high altmetric score only the number mentions on Twitter were considered. Probably using other methods can affect the results of the study and those results can be compared to the current study.

The above-mentioned suggestions for further research not only can enable academic libraries and researchers in the field of LIS to know how much altmetrics are popular among them but also help them to see the value of sharing their publications in order to be seen or read. In general, academic libraries must keep on improving their services and should continue to act as a beacon for the whole scholars’ community and the altmetrics has the potential to make the path easier.
8 Summary

This is the summary of this thesis. It gives a brief overview of the study and outlines the main choices and results.

8.1 Introduction

Researchers have always exchanged their ideas and criticism by discussing. This discussion had been done offline before, but with the advent of current technologies such as research blogs, Twitter, and Mendeley as reference management software, these conversations are moving online. Traditionally, scholarly impact and visibility have been measured by counting publications and citations in the scholarly literature. But now, scholars are increasingly visible on the Web. Twitter, Mendeley and others are quite well-known and interesting tools for researchers, both as a work tool and a subject of investigation. Based on the capabilities of altmetrics, this study is conducted in order not only to trace the visibility of LIS academic papers but additionally to investigate to what extent these research are visible for different target groups and, specifically, for librarians.

With these aims in mind, along with provided background, this study will try to answer the following questions by utilizing alternative indicators based on the web and social media (Mendeley reader counts, twitter mentions, Facebook):

➢ What is the altmetric coverage and “impact” of academic articles published by researchers associated with Swedish universities within the field of LIS between 2013 and 2017?
➢ What is the demographic makeup of the people who used and shared these articles?
➢ Which research topics in LIS received most altmetric attention between 2013 and 2017?

8.2 Methodology and theory

This study can be considered quantitative. The material used to answer the research questions are obtained from two different sources. First, to achieve a comprehensive sample of publications, SwePub was used as a main source of data collection. As a second step, “Altmetric Explorer” was used to collect data on articles from different sources. The Altmetric system provides data from social media sites like Twitter, Facebook, Google +, and online reference managers like Mendeley and CiteULike, including blog posts. Collected data from these sources are measured to calculate a final altmetrics number. Out of 170 peer-reviewed journal articles written in English, 69 altmetrics scores were transplanted to an excel file for further analysis.

The obtained data was interpreted using a theoretical framework that is based on two different directions in the sociology of science: normative theory of Merton’s norm and the theory of social constructivism.
8.3 Results and conclusions

Mendeley had the best coverage of altmetrics data sources with 65 percent of the articles having at least one reader (Fig. 6.1). A little more than 33 percent of the articles were mentioned on Twitter, a handful of articles where mentioned on Facebook, and of the 53 articles, none of them were mentioned on blogs or CiteULike. On average, the articles had around 23 readers in Mendeley, while the average of tweets was 12.

The result also showed that in LIS, researchers were the main Mendeley article readers between 2013 to 2017 with 53 percent, followed by general public at 26 percent. One must keep in mind that all of the professions are self-reported and based on the information provided by each individual on Mendeley. In order to deal with readers’ geographical distribution, data was collected from the Altmetric.com database. These findings show that a minority of the readers are located in Sweden (1 percent). Focusing on the level of international distribution of papers, it is interesting to note that the majority of articles were read in other countries, which can be interpreted as Mendeley’s lack of popularity among Swedish scholars.

In term of sharing LIS articles in Twitter, public users were the main group that shared articles between 2013 to 2017. Researchers were the second-largest group sharing LIS articles on the platform. The next group is comprised of organizations and bots, including some Swedish universities or publications that shared articles. To recognize the nationality of users who shared LIS articles on Twitter, data was collected from the altmetrics database. Fig 6.8 presents the users’ geographic distribution on Twitter. It shows that a minority of the users were in Sweden (9 percent) and the other 91 percent were either from other countries or had not yet declared their location, hardly strange among Twitter users. Focusing the international distribution of papers, it is interesting to note that most articles were shared by people not residing in Sweden.

The last part of the findings focuses on the topics mentioned most often on Twitter. It shows that most topics are associated with bibliometrics and citation impacts, many of the highly ‘read’ papers were written by two or more authors, and many of them could be categorized as interdisciplinary. This means that this group of articles were indexed in several domains across the social science and the natural sciences.

What became apparent in the analysis is the chance that altmetrics methods offer the LIS fields is substantial, but there are several issues that have yet to be considered in order to identify the potential of these measurements. Many arguments against the use of altmetrics methods refer to the publication channels used by scholars, the continuing reliance on print in many disciplines, and the low coverage of non-English language publications. However, the continuing development and diversification of methods suggests that altmetrics has great potential to turn into an invaluable tool for evaluating research.
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